

This listing of the claims will replace all prior versions, and listings, of claims in the application:

1. (Currently amended) A method of making electrically conductive bumps of improved height on a semiconductor device comprising:

depositing an under bump metallurgy over a semiconductor device having a contact pad and thereon and a passivation layer as an upper surface of the semiconductor device and an opening formed in the passivation layer down to the contact pad and so that the under bump metallurgy extends into the opening and onto the contact pad;

depositing, developing and patterning a photoresist layer over the semiconductor device to provide an opening over the under bump metallurgy and aligned with the contact pad;

depositing a first electrically conductive material into the opening in the photoresist layer;

depositing a second electrically conductive material over the first electrically conductive material and over a portion of the photoresist layer;

removing the photoresist layer;

A2 removing excess under bump metallurgy to leave a portion of the under bump metallurgy overlying the contact pad and underneath the first electrically conductive material;

applying a flux agent to the top surface of the second electrically conductive material;

heating the semiconductor device to remove any oxide on the second electrically conductive material;

dipping a portion of the semiconductor device in an electroless plating solution;

removing the semiconductor device from the electroless plating solution to provide a third electrically conductive material deposited on the second electrically conductive material; and

reflowing the electrically conductive materials to provide a bump of improved height on the semiconductor device.

2. (Original) A method as set forth in claim 1 further comprising the step of sputter cleaning the semiconductor device prior to the step of depositing an under bump metallurgy over the semiconductor device.

3. (Original) A method as set forth in claim 1 wherein the first electrically conductive material comprises solder.

4. (Original) A method as set forth in claim 1 wherein the second electrically conductive material comprises copper.

5. (Original) A method as set forth in claim 1 wherein the second electrically conductive material comprises nickel.

6. (Original) A method as set forth in claim 1 wherein the third electrically conductive material comprises at least one of copper, nickel, silver and gold.

7. (Original) A method as set forth in claim 1 wherein the step of depositing a first electrically conductive material comprises electroplating the first electrically conductive material into the opening in the photoresist layer.

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8. (Original) A method as set forth in claim 7 wherein the first electrically conductive material comprises solder.

9. (Original) A method as set forth in claim 1 wherein the step of depositing a second electrically conductive material comprises electroplating the second electrically conductive material onto the first electrically conductive material.

10. (Original) A method as set forth in claim 9 wherein the second electrically conductive material comprises at least one of copper and nickel.

11. (Currently amended) A method of making electrically conductive bumps of improved height on a semiconductor device comprising:

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cont. depositing an under bump metallurgy over a semiconductor device having a contact pad thereon and a passivation layer as an upper surface of the semiconductor device and an opening formed in the passivation layer down to the contact pad ~~and~~ so that the under bump metallurgy extends into the opening and onto the contact pad;

depositing, developing and patterning a photoresist layer over the semiconductor device to provide an opening over the under bump metallurgy and aligned with the contact pad;

depositing a first electrically conductive material into the opening in the photoresist layer;

depositing a second electrically conductive material over the first electrically conductive material and over a portion of the photoresist layer;

applying a flux agent to the top surface of the second electrically conductive material;

hard baking the semiconductor device comprising heating the semiconductor device to remove any oxide on the second electrically conductive material;
removing the photoresist layer after the hard ~~bake step~~ baking;
removing excess under bump metallurgy to leave a portion of the under bump metallurgy overlying the contact pad and underneath the first electrically conductive material;
dipping a portion of the semiconductor device in an electroless plating solution;
removing the semiconductor device from the electroless plating solution to provide a third electrically conductive material deposited on the second electrically conductive material;
and
reflowing the electrically conductive materials to provide a bump of improved height on the semiconductor device.

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12. (Original) A method as set forth in claim 11 further comprising the step of sputter cleaning the semiconductor device prior to the step of depositing an under bump metallurgy over the semiconductor device.

13. (Original) A method as set forth in claim 11 wherein the first electrically conductive material comprises solder.

14. (Original) A method as set forth in claim 11 wherein the second electrically conductive material comprises copper.

15. (Original) A method as set forth in claim 11 wherein the second electrically conductive material comprises nickel.

16. (Original) A method as set forth in claim 11 wherein the third electrically conductive material comprises at least one of copper, nickel, silver and gold.

17. (Original) A method as set forth in claim 11 wherein the step of depositing a first electrically conductive material comprises electroplating the first electrically conductive material into the opening in the photoresist layer.

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18. (Original) A method as set forth in claim 17 wherein the first electrically conductive material comprises solder.

19. (Original) A method as set forth in claim 11 wherein the step of depositing a second electrically conductive material comprises electroplating the second electrically conductive material onto the first electrically conductive material.

20. (Original) A method as set forth in claim 19 wherein the second electrically conductive material comprises at least one of copper and nickel.

21. (New) A method of making electrically conductive bumps of improved height on a semiconductor device comprising:

depositing an under bump metallurgy over a semiconductor device having a contact pad and thereon and a passivation layer as an upper surface of the semiconductor device and an opening formed in the passivation layer down to the contact pad so that the under bump metallurgy extends into the opening and onto the contact pad;

depositing, developing and patterning a photoresist layer over the semiconductor device to provide an opening over the under bump metallurgy and aligned with the contact pad;

depositing a first electrically conductive material into the opening in the photoresist layer;

depositing a second electrically conductive material over the first electrically conductive material and over a portion of the photoresist layer.

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22. (New) A method as set forth in claim 21 further comprising

removing the photoresist layer;

removing excess under bump metallurgy to leave a portion of the under bump metallurgy overlying the contact pad and underneath the first electrically conductive material;

dipping a portion of the semiconductor device in an electroless plating solution;

removing the semiconductor device from the electroless plating solution to provide a third electrically conductive material deposited on the second electrically conductive material;
and

reflowing the electrically conductive materials to provide a bump of improved height on the semiconductor device.

23. (New) A method as set forth in claim 22 further comprising
applying a flux agent to the top surface of the second electrically conductive material
prior to the dipping;
heating the semiconductor device to remove any oxide on the second electrically
conductive material prior to the dipping.

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24. (New) A method as set forth in claim 22 further comprising
applying a flux agent to the top surface of the second electrically conductive material
prior to depositing the second electrically conductive material;
heating the semiconductor device to remove any oxide on the second electrically
conductive material prior to depositing the second electrically conductive material.
